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which changed the refining practise as did the Arents siphon tap the blast-furnace work, and the systematization of the complications in the Parkes process, which is more largely due to E. F. Eurich than to anybody else, and which forms the basis of the modern American practise. We miss also any record of some early eastern refineries, as, *e. g.*, the Delaware Lead Works at Philadelphia, and other smaller plants around New York. Chapters V.-XII. give a detailed history of the mining and metallurgical operations of the several states and territories. The production of metal at different periods is usually given, although in some cases, *e. g.*, in Montana, the data are missing. The remaining 55 pages of the 255 given to lead deal with the statistics of production, consumption and prices, with the commercial conditions, the tariff on lead, the labor conditions and with trade agreements and combinations.

The second part, which takes up 90 pages, treats of the history of zinc according to the same general plan as followed with lead. The mechanical concentration of zinc ores, which plays such an important part in the treatment, receives a separate chapter. The chapter on the metallurgy of zinc, the author's specialty, contains a critical review of the different types of distilling furnaces which have been and are used in this country; it is a chapter which every metallurgist will study with profit and pleasure.

The book, as a whole, is most satisfactory, as it is replete with valuable information presented in an interesting way. Last, but not least, it has a full index which enables the student to look up points upon which he desires enlightenment.

H. O. HOFMAN

SCIENTIFIC JOURNALS AND ARTICLES

The American Naturalist for January begins with the first part of a paper by Robert F. Griggs, on "Juvenile Kelps and the Recapitulation Theory." J. Stafford describes "The Larva and Spat of the Canadian Oyster," giving special attention to the microscopic stages mostly omitted in the work of W. K. Brooks. Waldemar Jochelson presents

some interesting notes on "Traditions of the Natives of Northeastern Siberia about the Mammoth" and there are other notes on "The Age of Trotting Horse Sires" and "The Influence of Environment upon Animals."

The American Museum Journal for January has articles on "The Duck Hawk, Hackensack Meadow, and Egret Groups," "Two Noteworthy Museums" (the Congo Museum, Brussels, and Senckenburg Museum, Frankfurt), "The International Tuberculosis Exhibition" and "An Ethnological Trip to Lake Athabasca," besides notes, lists of members elected since the last issue, and the lecture announcements.

The Bulletin of the Charleston Museum for December gives an account, with plan, of "The New Building" which contains the collections, library and lecture room. A note on "The History of the Museum" shows that so late as 1843 it was still under the auspices of the Literary and Philosophical Society of Charleston.

The Museum News of the Brooklyn Institute for January contains an article on "The Hoatzin," by Geo. K. Cherrie, which gives a very full account of this interesting bird and includes a considerable amount of new information gathered by Mr. Cherrie. A note on the leather-back turtle given by the New York Aquarium, states its weight to have been a little over 840 pounds; extreme length, following curve, 6 feet, 10 inches, from flipper to flipper over shoulders, 8 feet, 9 inches. The Children's Museum section gives "Some Evidences of Progress in 1908" in the matters of increased attendance by both children and teachers, and an increasing use of the collections and library.

BOTANICAL NOTES

PHYSIOLOGY AND ECOLOGY

ALFRED DACHNOWSKI's brief paper on "The Toxic Property of Bog Water and Bog Soil" (*Bot. Gaz.*, Aug., 1908) is an attempt to contribute something to the solution of the problem of bog conditions so far as vegetation is concerned. Studies were made of a bog island in Buckeye Lake in central Ohio which ap-

peared to confirm the observer in the view that bog-water does contain toxic substances.

Geo. F. Freeman tells (*Bot. Gaz.*, Aug., 1908) of "A Method for the Quantitative Determination of Transpiration in Plants," which consists in using phosphorus-pentoxid U-tubes through which a current of air is drawn by an aspirator. This air current previously flows over the enclosed foliage of the plant under examination, and the moisture which it contains (as a consequence of transpiration) is absorbed by the phosphorus-pentoxid. The increase in weight of the latter enables the experimenter to determine the amount of transpiration.

Somewhat like the preceding is Dr. G. J. Peirce's paper on "A New Respiration Calorimeter" (*Bot. Gaz.*, Sept., 1908) in which after pointing out some errors and crudities in some popular lectures and experiments he describes the simple apparatus which he has found useful. Dewar flasks (with double walls enclosing a vacuum) were used, and it was found that these when silvered enabled the experimenter to obtain results that were quite impossible with other apparatus. Dewar flasks are also popularly known as "thermal bottles," but those supplied in chemical glassware are more serviceable and less expensive.

The question of the effect of illuminating gas upon plants is one of much popular interest and has been investigated by Messrs. Crocker and Knight and the results published in a paper ("Effect of Illuminating Gas and Ethylene upon Flowering Carnations") in the *Botanical Gazette* for October, 1908. They find that one part of gas in 40,000 parts of air kills the young flower buds, and that 1 part of ethylene in 1,000,000 parts of air is harmful.

J. F. McClendon's paper "On the Xerophytic Adaptations of Leaf Structure in Yuccas, Agaves and Nolinias" (*Am. Nat.*, May, 1908) brings together a number of interesting structural details in regard to the epidermis, stomata and general leaf-structure of these plants.

Here should be noticed Professor L. H. Harvey's very helpful paper on the "Floral Succession in the Prairie-grass Formation of

Southeastern South Dakota" (*Bot. Gaz.*, Aug. and Oct., 1908) in which he gives a good idea of the vegetation of the region by an unusually clear discussion, aided by carefully selected photographs.

A suggestive paper entitled "A Study of the Variation of the Number of Ray Flowers of Certain Compositae" by Mr. W. Dudgeon recently appeared in the *Proceedings of the Iowa Academy of Sciences* (Vol. XVI.), in which the author shows by careful counts of several thousand heads from different localities, first, that there is a wide variation in the number, and second, that the highest numbers are the same in the different localities. Thus in *Rudbeckia hirta* the rays range from 2 to 28, with the greatest number of heads having 13. *Rudbeckia triloba* ranges from 5 to 14, with 8 as the normal, while in *Helianthus grosse-serratus* the range is from 7 to 25, with 13 as the normal.

Dr. Henri Hus contributes a paper in the February *American Naturalist* to the obscure subject of teratology, under the title of "Fasciations of Known Causation," in which he enumerates four "causes": (1) mechanical, (2) cases where no injury can be traced, (3) fungi, (4) insects. In his paper these are discussed at length, and numerous examples are cited.

ECONOMIC BOTANY

F. C. STEWART, of the New York Agricultural Experiment Station (Geneva), prints an instructive summary of the botanical investigations made in the station during the past twenty-five years. And it is an excellent record, and had the station accomplished no more in this time than is here enumerated in one department alone, it would have fully repaid the state for the money expended. On looking over the paper one is amazed at how much has been done in these twenty-five years. The diseases of more than thirty kinds of plants have been studied, including most of the standard crops of the state, as apple, asparagus, bean, beet, cabbage, carnation, cauliflower, celery, etc. The alphabetical arrangement makes it easy to find what has been done in the study of the diseases of this or that

plant. Incidentally it becomes a handy reference to the literature of the plant diseases investigated at this station.

H. S. Jackson's address on the "Development of Disease-Resistant Varieties of Plants," given before the Massachusetts Horticultural Society, March 14, 1908, and printed in its proceedings, is a clear popular discussion of a most important but poorly understood subject. Recognizing that "spraying is a nuisance at best" the speaker urged that more attention should be given to the development of varieties which are resistant to disease, suggesting (a) the selection of individuals, (b) the selection of varieties and (c) hybridization followed by selection of varieties and individuals. Brief discussions of what has been accomplished in regard to wheat, clover, cow peas, potatoes, tobacco, cotton, etc., are given which will astonish those who have not followed the work of the last few years; the difficulties are candidly pointed out, and something is said as to the cause of immunity, and the possibility of artificial immunity.

Dr. E. M. East's paper, entitled "A Study of the Factors Influencing the Improvement of the Potato" (Bull. 127, Ill. Expt. Station) is valuable not only from a practical standpoint, but also for the history of the potato which is given in the introductory pages. After this, methods of breeding, inheritance of characters in tuber selections (in which the author regards the gain as doubtful), degeneration of varieties (the author concluding that varieties do not run out), mutations, etc., are taken up in succession. The author suggests three possible methods of improvement, viz., (1) crossing of desirable plants, (2) selections of the most desirable fluctuations among the plants and tubers of a variety, (3) selection of discontinuous variations and a study of ways of causing them, and regards the first as most promising.

Here should be noticed J. E. Rockwell's "Index to Papers relating to Plant-Industry Subjects in the Year-books of the United States Department of Agriculture," which will save much time and labor to the botanist who has occasion to refer to the many valuable

botanical papers published in the agricultural year-books.

Three recent papers by Dr. Kraemer in the *American Journal of Pharmacy* are of interest to the plant histologist as well as the pharmacist, viz., "Microscopical and Chemical Examinations of Black Pepper," the same for commercial ginger, and some distinguishing characters of belladonna and scopolia. Each paper is well illustrated by many clear figures.

CHARLES E. BESSEY

THE UNIVERSITY OF NEBRASKA

SPECIAL ARTICLES

SEX DETERMINATION AND PARTHENOGENESIS IN PHYLLOXERANS AND APHIDS

THE phylloxera of the hickories offer exceptional opportunities for a study of sex-determination and parthenogenesis. In some species three generations can be followed within the same gall—two parthenogenetic and one sexual. We can determine the number of males and females that have descended from the same fertilized egg, as well as the influence of external conditions in affecting the number and kind of individuals in each generation. Immense numbers of eggs can be obtained. They furnish also excellent, although difficult, cytological material.

During three years I have studied the cytological aspects of the life cycle and can now present an almost complete account of the remarkable chromosomal changes that occur in connection with sex-determination.

I wish to lay especial emphasis on three points:

1. In many insects it has been found that sex is connected with, or produced by, two kinds of spermatozoa. But in phylloxerans, aphids, bees, ants, in certain saw-flies, in daphnians and in hydatina, the fertilized eggs produce only females. In the phylloxerans and aphids the result is connected with the formation of only functional female-producing spermatozoa—the male-producing sperms degenerate. One may suspect that similar conditions are to be found in the other groups, and the facts of spermatogenesis in the bee, wasp and ant, support such a view.